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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/510,695	10/08/2004	Izumi Fusegawa	121356	3939
25944	7590	06/15/2006		
OLIFF & BERRIDGE, PLC P.O. BOX 19928 ALEXANDRIA, VA 22320			EXAMINER RAO, G NAGESH	
			ART UNIT 1722	PAPER NUMBER
DATE MAILED: 06/15/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>		<b>Applicant(s)</b>	
	10/510,695		FUSEGAWA ET AL.	
	<b>Examiner</b>		<b>Art Unit</b>	
	G. Nagesh Rao		1722	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 17 May 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 8-16 is/are pending in the application.
- 4a) Of the above claim(s) 14-16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 8-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

***Election/Restrictions***

1) Claims 14-16 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected set of inventions, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 5/17/06.

Examiner points out that applicant merely put forth that the search would not be a burden without providing any input or arguments to the provided references substantiating why the invention should be restricted. Furthermore examiner would like to point out that the method claims of 8-13 refer to a Czochralski method without performing Dash Necking method. Whereas claim 14 refers to the product made materially as a result of Czochralski method, which would therefore substantiate a difference in inventive scope, on not just that one set direct to method and the other set to the product but how they were made is materially different. In the next response, examiner would appreciate an argument to be made on why applicant considers this restriction to be improper. Till then restriction will maintained by the examiner.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2) Claims 9-10, 12-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The above claims are rejected for being unclear in scope as a result of dependent claim's 9 limitation. Claim 8 specifically states that the method of manufacturing occurs via Czochralski method without performing the Dash Necking method, however claim 9 states the method of manufacturing the silicon single crystal using the Dash Necking method. So how can claim 9 occur as a limitation in dependent claim format off of claim 8, when claim 8 states the contrary to claim 9's means of performing. Therefore claims 10 and 12-13 are rejected under USC 112 because of depending from faulty claim 9. Furthermore examiner is unclear by what is meant by "seed crystal into contact with the silicon melt to 10-20<sup>0</sup>C higher than temperature appropriate for bringing the seed crystal into contact with the silicon melt..." What is the appropriate temperature range for the melt in conjunction with the crystal, where is the basis for a 10-20 degree Celsius higher than without a temperature condition to attribute the limitation too? Applicant is advised to remedy the situation.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
- 3) Claims 8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iino (US Patent No. 6,197,108) in view of Sonoda (US Patent No. 5,911,823).

Iino 108 pertains to a method of manufacturing a monocrystalline silicon crystal via Czochralski method without performing a necking method such as the "Dash" comprising the steps of providing a seed crystal having a tip end with a sharp-pointed shape or a truncation thereof in which an angle of the tip is end is not less than  $3^{\circ}$  but not greater than  $28^{\circ}$ , whereby keeping the tip end of the seed

crystal at just above a silicon melt to heat it before bringing the tip end of the seed crystal into contact with the silicon melt, and therefore subsequently bringing the tip end of the seed crystal into contact with the silicon melt and immersing the seed crystal into the silicon melt to a desired diameter, whereby in certain embodiments a shifting may occur. As well Iino 108 suggests that this method can be used with prescribed pulling rates and the use of MCZ method, which utilizes a magnet chamber system (See Abstract, Col 3 Lines 35-68, Col 4 Lines 1-14, 40-68, Col 7 Lines 28-54, Col 10 Lines 16-24, Col 14 Lines 54-63, and Col 18 Lines 22-30).

However Iino 108 fails to explicitly teach the temperature variation of the silicon melt and its particular gradient. Albeit that Iino 108 inherently teaches there would need be a temperature condition set forth to utilize the seed crystal in conjunction with the melt, the method does not go into detail about those matters nor the particular direction of the crystal orientation when grown.

In a method referring to pulling a single crystal semiconductor and method of makine, Sonoda 823 teaches a similar method for a particular  $\langle 110 \rangle$  single crystal silicon whereupon it takes into account that there be very little temperature variation within the silicon melt in order to prevent defects from occurring in the seed crystal immersed in the melt. This is of course accomplished with a slow pulling rate but also the application of a magnetic field utilizing the MCZ

technique, whereby applying a field of 500 G or more, whereby the temperature variation depending on intensity can be reduced down to a 1.5-.1<sup>0</sup> Celsius range (See Abstract, Col 2 Lines 1-68).

Therefore at the time of the invention it would have been obvious to one having ordinary skill in the art to modify the teachings of Iino 108 with that of Sonoda 823 in order to optimize the seed crystal growth technique for fabricating better and less defect crystals as well realize that the method can be utilized for any particular crystal and its plane of orientation preferred via the method of producing.

4) Claims 9-10 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iino (US Patent No. 6,197,108) in view of Sonoda (US Patent No. 5,911,823) in further view of Sakurada (US Patent No. 6,913,646) in further view of Abe (US Patent No 5,911,822).

Examiner is presuming that claim 9 would be amended to properly limit claim 8 referring to the lack of a Dash Necking method, than as currently claimed and facing the 112 rejection.

From the aforementioned relevant combination of art between Iino 108 and Sonoda 823, the applicative art also covered the issue regarding use of a magnetic

intensity field in the method as well the particulars of growing the crystal via the preferred plane direction of growth such as the  $\langle 110 \rangle$  being well known to produce in the art.

However the prior art failed to teach the specified rates of the pulling rate as claimed by applicant. Although they teach pulling rates such as Iino 108 and Sonada 823 using a 1.5 –2.0 mm/min rate, it does not break down to reducing the rate down to .5 mm/min as claimed by applicant.

However in a related application of method for making silicon single crystal material, Sakurada 646 teaches pulling rates that are known to be down to .5 mm/min and as low as .02 mm/min depending on the diameter growth of the crystal to be achieved, and how defect free the crystal is to be including via MCZ process known for its use of magnetic fields (See Col 10 Lines 1-68). This of course is further substantiated by Abe 822 which pertains to a similar method as the aforementioned art, whereby it states that "...Melting as such a slow speed further reduces the possibility that slip dislocation is generated within the seed crystal during the melting operation..." (Col 3 Lines 46-52).

Therefore at the time of the invention it would have been obvious to one having ordinary skill in the art to routinely modify the pulling rate of Sonada 823

from 1.5mm/min to a .5mm/min in order to obtain the desired result as described by Abe 822.


Finally the prior art does not specifically address bringing the silicon crystal tip into a silicon melt that is 10-20 degrees Celsius higher than the tip temperature. However it does denote that the crystal tips are brought into the melt and can face a thermal gradient shock of the sorts, so therefore there would have to be a reasonable range of temperature variation in order to prevent any damaging of the seed crystal tip when immersed into the silicon melt as understood by Iino 108 (Col 3 Lines 55-68) and Sonada 823's various embodiments. This limitation could be determined via routine experimentation in order to figure out an optimal temperature processing range of the melt in conjunction with the seed crystal tip.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to G. Nagesh Rao whose telephone number is (571) 272-2946. The examiner can normally be reached on 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra Gupta can be reached on (571)272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

GNR



Robert Kunemund  
Primary Examiner  
TC1700